Claims

1. Apparatus microfabricated for performing cell growth and cell based assays in a liquid medium, said apparatus comprising:

a) a base plate supporting a plurality of micro-channel elements, each comprising a cell growth chamber, an inlet channel for supplying liquid sample thereto and an outlet channel for removal of liquid sample therefrom;

b) a cover plate positioned over said base plate said cover plate extending over said elements so as to define said chambers and connecting channels; said cover plate being supplied with holes to provide access to said channels; and

c) means, incorporated in said cell growth chambers, for cell attachment and cell growth.

2. Apparatus according to claim 1 wherein said base plate comprises a rotatable disc which is microfabricated to provide a sample introduction port located towards the centre of the disc and connected to an annular sample reservoir, and wherein said micro-channel elements are radially dispersed on said disc with their respective input channels connected to receive sample from said reservoir.

3. Apparatus according to claim1 or claim 2 wherein said cover plate is fabricated from a gas permeable plastics material.

4. Apparatus according to any one of claims1 to 3 wherein said means for cell attachment and cell growth comprises selectively treating or modifying at least a portion of a surface of said cell growth chamber.

5. Apparatus according to any one of claims 1 to 3 wherein means for cell attachment and cell growth comprises one or more microcarrier beads

located in said cell growth chamber, wherein each of said microcarrier beads provides for cell attachment and cell growth.

6. Apparatus according to any one of claims 1 to 5 wherein the cell growth chamber further includes raised moulded features disposed on the base portion of the cell growth chamber to form pillars.

7. Apparatus according to any one of claims 1 to 6 wherein the cross-sectional area of said inlet channel is greater than that of said outlet channel.

8. Apparatus according to claim 7 wherein the cross-sectional area of said outlet channel is between 0.99 and 0.01 times that of said inlet channel.

9. Apparatus according to any one of claims 1 to 8 wherein at least some of said micro-channel elements each further comprises one or more assay chambers for performing assays involving cellular constituents and connected in line between said cell growth chamber and said outlet channel.

10. Apparatus according to claim 9 wherein the assay chamber or chambers are connected to each other and to said cell growth chamber by an intermediate channel or channels in the order of: inlet channel, cell growth chamber, intermediate channel 1, assay chamber 1, intermediate channel 2 (if present), assay chamber 2 (if present)..... , outlet channel, and wherein the cross-sectional areas of the respective channels reduce progressively from the inlet channel to the outlet channel.

11. Apparatus according to claim 10 wherein the cross-sectional area of the or each intermediate channel and the outlet channel is between 0.99 and 0.01 times that of the immediately preceding (upstream) channel.

12. Apparatus according to any one of claims 1 to 11 wherein there is provided in or on an interior surface of one or more of said chambers a layer comprising a scintillant substance.

13. Apparatus according to claim 12 wherein the layer comprising a scintillant substance includes a binding moiety bound thereto, said binding moiety being a member of a specific binding pair selected from biotin, streptavidin, protein A, antibodies, lectins, hormone-receptors, nucleic acid probes, and DNA-binding proteins.

14 A method for determining the effect of a test substance on a cellular activity or physical parameter by the use of an apparatus as defined in claims 1-13, which method comprises:

a) providing a suspension of cells in a fluid medium;

b) introducing said cells into said apparatus and causing said cells to be transported to one or more cell growth chambers in said apparatus;

c) providing one or more samples of test substances whose effect upon the cells is to be measured under conditions so as to cause said cells to be exposed to said substances;

d) determining the effect of the test substances on said cells by means of optical detection.

15. A method according to claim 14 wherein cells are cultured adhering to a surface within the apparatus prior to the introduction of the test substances.

16. A method according to claims 14 or 15 wherein there are provided following step c) one or more assay reagents and dispersing said reagents to one or more reaction chambers in said apparatus.

17. A method according to claim 16 wherein at least one of said assay reagents is labelled with a detectable label selected from fluorescent labels, chemiluminescent labels, bioluminescent labels, enzyme labels and radioactive labels.

18. A method for measuring a cellular analyte by the use of the apparatus as defined in claims 1-13, which method comprises:

a) providing a suspension of cells containing an analyte to be measured in a fluid medium;

b) introducing said cells into said apparatus and causing the cells to be transported to one or more cell growth chambers in the apparatus;

c) allowing cells to grow;

d) providing one or more assay reagents and dispersing said reagents to one or more chambers in said apparatus;

e) measuring the cellular analyte by optical means.

19. A method according to claim 18 wherein at least one of said assay reagents is labelled with a detectable label selected from fluorescent labels, chemiluminescent labels, bioluminescent labels, enzyme labels and radioactive labels.